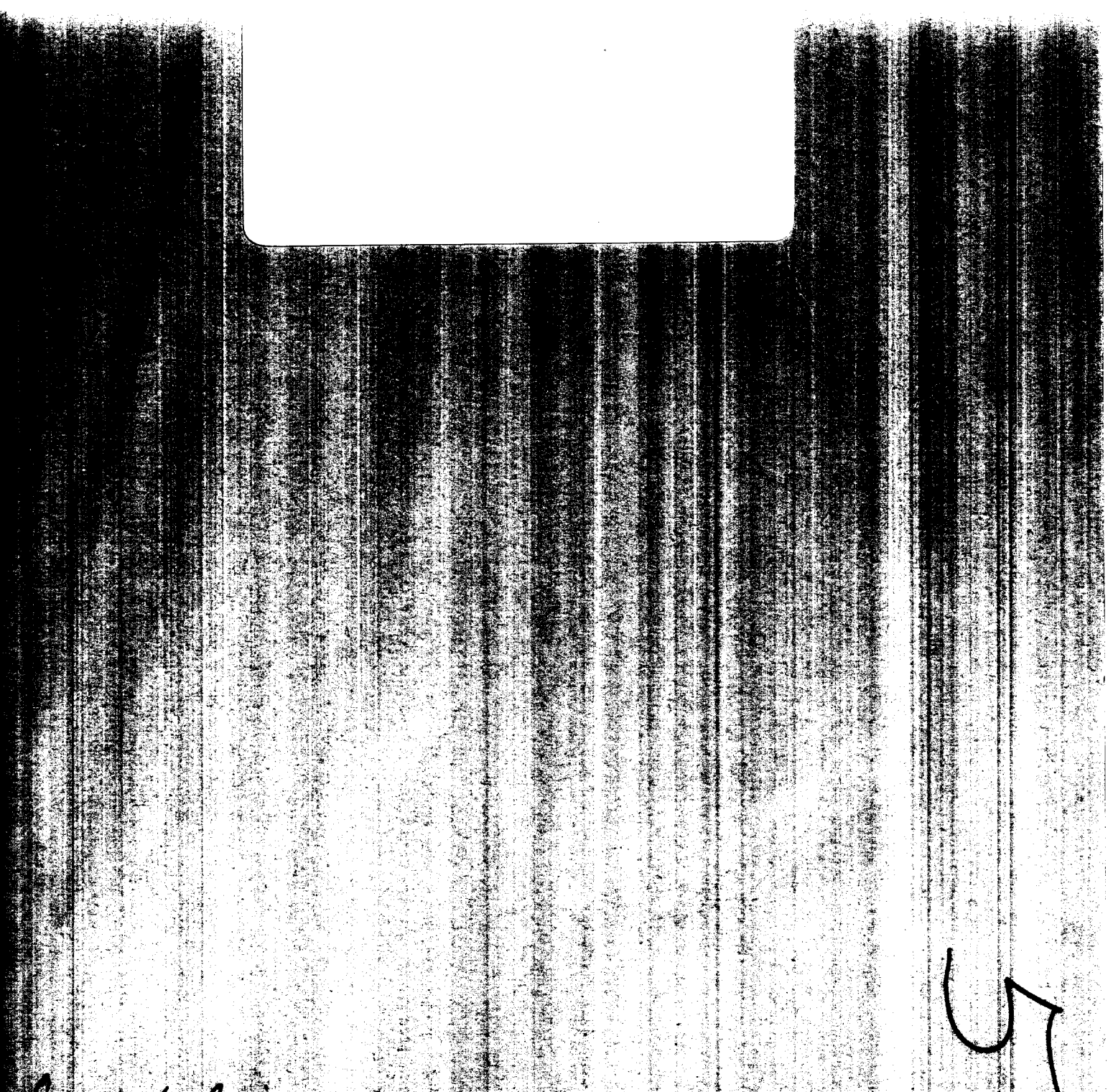
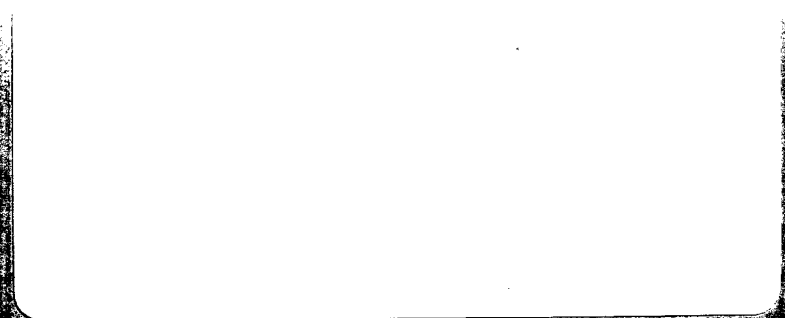


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25 YEAR RE-REVIEW

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Cost Estimate
for
"Project Moonshine"

Document # 111

February 10, 1960

Prepared by:

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Reviewed by:

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The purpose of this document is to present a revised cost estimate for "Project Moonshine", in order to accommodate certain re-appraisals which have occurred since the publication of document # 84, "Proposal for Project Moonshine", December 5th, 1959.

The changes in estimated costs are essentially the reflection of seven considerations. These are:

1. Optical Fabrication

Our manufacturing facility has produced a detailed cost estimate for the 18 f/3.8 Baker Schmidt system. This estimate may be considered as much more accurate than the previous one reported in Document #84 in that the earlier one was based on only qualitative descriptions of possible systems of a variety of over all sizes.

2. Window Materials

This cost estimate reflects the possibility of a satisfactory window consisting of only a single piece of quartz. While experiments are now in progress to establish what will be acceptable the facts are not yet known. We here propose that if it proves necessary to provide a more complex window this will constitute a change in scope.

3. Spares

This proposal includes the costs of all engineering, fabrication, component tests, assembly tests and system tests in plant, in test vehicles and in the article.

It does not include more spares than are now estimated as required for the flight test program nor does it include any support of flight operations after engineering tests are complete.

4. Maintenance and Overhaul (In-Plant)

In-plant maintenance and overhaul will be confined to support of systems during their flight test phase, prior to customer acceptance. There is no consideration for maintenance and overhaul or product improvement as part of "operational" support.

This has resulted in a reduction of estimated costs.

5. Flight Test Program (Site)

The flight test program will be confined to support of systems during their flight test phase, prior to customer acceptance.

What at Site?

There is no consideration for "operational" support at the site.

This has resulted in a reduction of estimated costs.

6. Reliability

Re-estimates from sub-contractors regarding a parallel V/h sensor program and vibration consulting services, coupled with the assumption that certain "test-bed" facilities will be customer furnished, has resulted in a reduction of estimated costs.

What Req?

7. Costs

Continued engineering establishes the requirement for more accurate gyros for stabilization. This has resulted in an increase of estimated costs for this area.

This cost estimate is divided into six sections, as follows:

1. Prototype
2. Field Support Equipment
3. Spare Parts
4. Flight Test Program
5. Five Additional Systems (2-6)
6. Nine Additional Systems (2-10)

1. Estimated Costs for Prototype

(Reference Document # 84 for Descriptions of Activities)

A. Project Direction (21 months) \$ 110,817.00

B. Project Control (21 months) \$ 192,162.00

C. Creative Engineering (Excluding Windows)

1. Engineering \$ 1,089,000.

2. Purchases \$ 100,000.

3. Fabrication \$ 60,000.

4. Travel \$ 40,000.

\$ 1,289,000.00

D. Reliability

1. Engineering \$ 180,000.

2. Fabrication \$ 119,000.

3. Sub-Contracts

a. Vibration \$ 100,000.

b. V/H Sensor \$ 40,000.

c. Environmental
Tests \$ 20,000.

\$ 160,000.

4. Travel \$ 3,000.

\$ 462,000.00

E. Hardware (Excluding Windows)

1. Glass

a. Material \$ 29,000.

b. Fabrication \$ 28,000.

c. Tooling \$ 70,000. *

\$ 127,000.

2. Metal

a. Material \$ 6,000.

b. Fabrication \$ 60,000.

c. Sub-Contract \$ 90,000.

d. Tooling \$ 27,000.

\$ 183,000.

3. Purchases	\$ 60,000.
4. Quality Control	\$ 16,300.
5. Travel	<u>\$ 8,000.</u>

\$ 394,300.00

F. Windows

1. Development	
a. Engineering	\$ 160,000.
b. Fabrication	\$ 10,000.
c. Purchases	\$ 28,000.
d. Sub-contracts	\$ 15,000.
e. Travel	<u>\$ 7,000.</u>
	\$ 220,000.

2. Manufacturing	
a. Material	\$ 29,000.
b. Fabrication	\$ 24,000.
c. Quality Control	\$ 1,200.
d. Tooling	<u>\$ 10,000. *</u>
	<u>\$ 64,200.</u>

\$ 284,200.00

* See Attachment "A" for Capital Equipment Req'd. in addition to this tooling.

2. Estimated Costs for Field Support Equipment

(Reference Document # 84 for Description of Equipment)

A. Engineering	\$ 89,000.
B. Glass	\$ 23,200.
C. Purchases	\$ 25,000.
D. Fabrication	\$ 75,000.
E. Sub contract	\$ 25,000.
F. Quality Control	\$ 9,500.
G. Travel	<u>\$ 3,000.</u>

\$ 249,700.

3. Cost Estimate for Spare Parts
(including windows)

A. Engineering	\$ 7,898.00	
B. Glass	\$ 50,000.00	
C. Purchases	\$ 30,000.00	
D. Fabrication	\$ 50,500.00	
E. Quality Control	\$ 8,000.00	
F. Travel	<u>\$ 3,000.00</u>	
		\$ 149,398.00

4. Estimated Costs for Flight Test Program

Number of Systems to be Flight Tested	Duration of Flight Tests (at site)	Project Direction	Project Control	In-Plant Support	Flight Test Group at site	Travel & Field Adjustment	Instrumen- tation	Total Estimated Costs
Prototype only	6 months	\$31,500.	\$54,910.	\$ 72,000.	\$ 98,000.	\$35,000.	\$50,000.	\$341,410.
Prototype and five additional systems	13 months	\$38,000.	\$62,000.	\$156,000.	\$169,000.	\$63,000.	\$50,000.	\$538,000.
Prototype and nine additional systems	17 months	\$41,000.	\$70,947.	\$204,000.	\$221,000.	\$84,000.	\$50,000.	\$670,947.

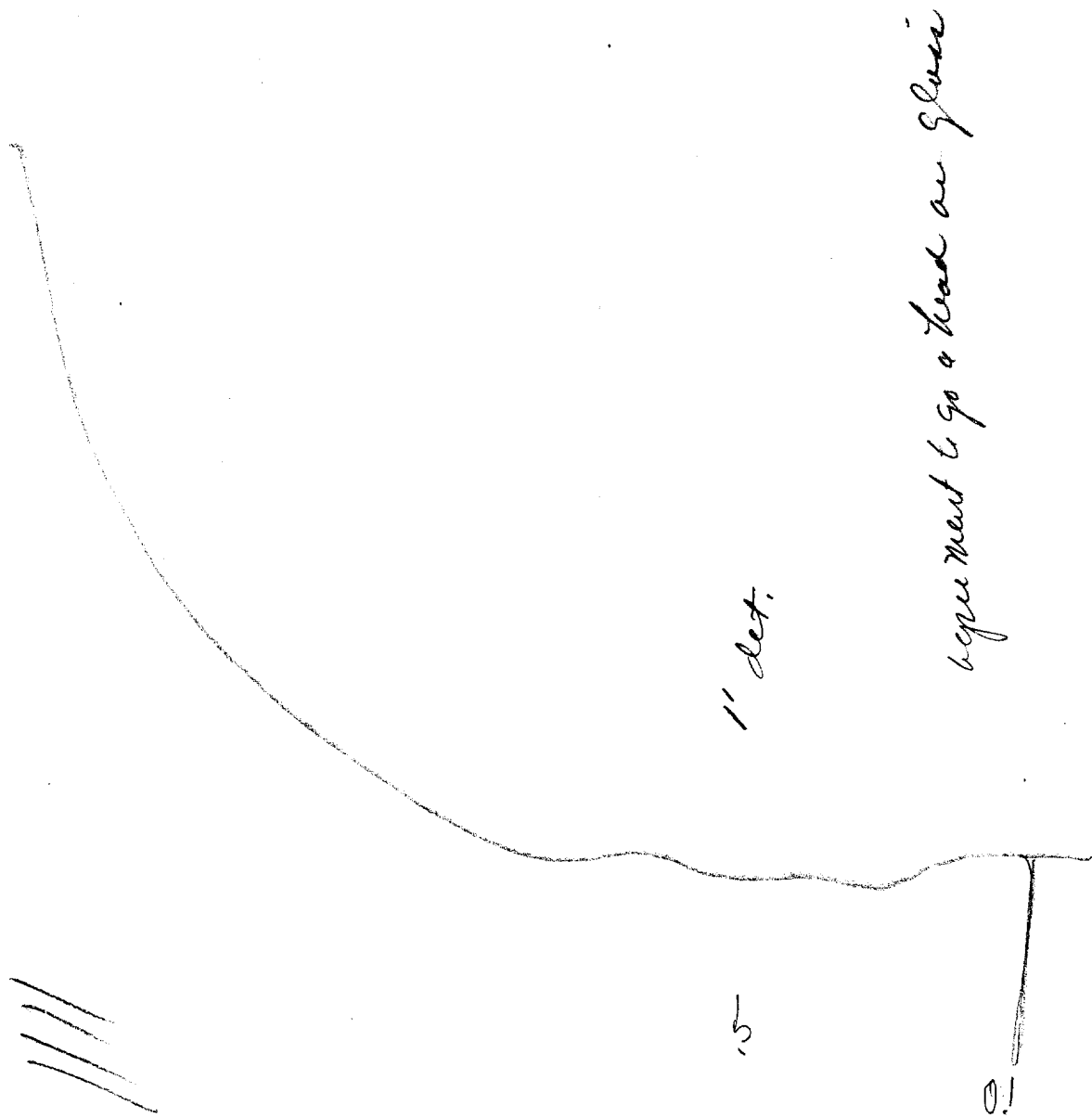
5. Estimated Costs for Five Additional Systems

Systems Hardware

A. Project Direction		\$ 30,614.00	
B. Project Control		\$ 56,476.00	
C. Engineering		\$ 261,000.00	
D. Reliability		\$ 27,800.00	
E. Glass			
Material	\$ 84,000.		
Fabrication	\$ 90,000.		
Tooling	\$ 10,000.		
Quality Control	<u>\$ 6,000.</u>		
		\$ 190,000.00	
F. Windows			
Material	\$ 145,000.		
Fabrication	\$ 80,000.		
Quality Control	\$ 5,000.		
Travel	<u>\$ 5,000.</u>		
		\$ 233,000.00	
G. Purchases		\$ 300,000.00	
H. Metal			
Material	\$ 5,000.		
Fabrication	\$ 410,000.		
Tooling	\$ 30,000.		
Quality Control	<u>\$ 41,000.</u>		
		\$ 486,000.00	
I. Travel		<u>\$ 25,000.00</u>	
			\$ 1,610,390.00

6. Estimated Costs for Nine Additional Systems**Systems Hardware**

A. Project Direction		\$ 48,721.00
B. Project Control		\$ 84,639.00
C. Engineering		\$ 470,000.00
D. Reliability		\$ 50,000.00
E. Glass		
Material	\$ 150,000.	
Fabrication	\$ 160,000.	
Tooling	\$ 10,000.	
Quality Control	<u>\$ 11,000.</u>	
		\$ 331,000.00
F. Windows		
Material	\$ 260,000.	
Fabrication	\$ 140,000.	
Quality Control	\$ 9,000.	
Travel	\$ 5,000.	
		\$ 414,000.00
G. Purchases		\$ 540,000.00
H. Metal		
Material	\$ 9,000.	
Fabrication	\$ 740,000.	
Tooling	\$ 30,000.	
Quality Control	\$ 74,000.	
		\$ 853,000.00
I. Travel		<u>\$ 45,000.00</u>
		\$ 2,836,360.00



SCHEDULE "A"

SUMMARY OF PRIME COSTS

	Engineer's	Admin.	Plant Service	Quality Control	Raw Glass	Material	Purchase Items	Fabr.	Sub Contract	Travel	Tooling	Total
Project Direction	\$ 110,817.											\$ 110,817.
Project Control		\$ 88,158.	\$ 60,321.				\$ 43,683.					192,162.
Engr'g & Development	1,089,000.						100,000.	\$ 60,000.		40,000.		1,289,000.
Reliability	130,000.							119,000.	160,000.	3,000.		462,000.
System Hardware				\$ 16,300.	\$ 29,000.	6,000.	60,000.	88,000.	90,000.	8,000.	97,000.	394,300.
Windows	160,000.			1,200.	57,000.			34,000.	15,000.	7,000.	10,000.	284,200.
Project Direction	30,614.											30,614.
Project Control		26,152.	17,890.				12,934.					56,976.
Engr'g. & Development												27,800.
Reliability	27,800.											1,262,000.
System Hardware	261,000.			47,000.	84,000.	5,000.	300,000.	500,000.		25,000.	40,000.	233,000.
Windows				5,000.	145,000.			80,000.		3,000.		48,721.
Project Direction	48,721.											84,639.
Project Control		38,831.	26,568.				19,240.					50,000.
Engr'g. & Development												2,239,000.
Reliability	50,000.											414,000.
System Hardware	470,000.			85,000.	150,000.	9,000.	540,000.	900,000.		45,000.	40,000.	
Windows				9,000.	260,000.			140,000.		5,000.		
Field Support Equipment	89,000.			9,500.	23,200.		25,000.	75,000.	25,000.	3,000.		249,700.
Spare	7,898.			8,000.	50,000.		30,000.	50,500.		3,000.		149,398.
Flight Test For (1)	170,000.						62,465.			35,000.		267,465.
Project Direction	31,500.											31,500.
Project Control		25,205.	17,240.									42,445.
Flight Test For (6)	325,000.						64,074.			63,000.		452,074.
Project Direction	38,000.											38,000.
Project Control		28,458.	19,460.									47,926.
Flight Test For (10)	425,000.						66,127.			84,000.		575,127.
Project Direction	41,000.											41,000.
Project Control		32,550.	22,270.									54,820.

SUMMARY OF COST ESTIMATE

PRIME COST

1. Prototype Only

Prototype-----	\$	2,732,479.00	
Field Support Equipment-----	\$	249,700.00	
Spare Parts-----	\$	149,398.00	
Flight Test Program-----	\$	341,410.00	
			\$ 3,472,987.00

2. Prototype and Five Additional Systems

Prototype-----	\$	2,732,479.00	
5 Additional Systems-----	\$	1,610,390.00	
Field Support Equipment-----	\$	249,700.00	
Spare Parts-----	\$	149,398.00	
Flight Test Program-----	\$	538,000.00	
			\$ 5,279,967.00

3. Prototype and Nine Additional Systems

Prototype-----	\$	2,732,479.00	
9 Additional Systems-----	\$	2,836,360.00	
Field Support Equipment-----	\$	249,700.00	
Spare Parts-----	\$	149,398.00	
Flight Test Program-----	\$	670,947.00	
			\$ 6,638,884.00

SUMMARY OF ESTIMATE

	<u>Prototype Only</u>	<u>Prototype and Five Additional Systems</u>	<u>Prototype and Nine Additional Systems</u>
Prototype	\$2,732,479.00	\$2,732,479.00	\$2,732,479.00
Field Support Equipment	\$ 249,700.00	\$ 249,700.00	\$ 249,700.00
Spare Parts	\$ 149,398.00	\$ 149,398.00	\$ 149,398.00
Flight Test Program	\$ 341,410.00	\$ 538,000.00	\$ 670,947.00
Five Additional Systems	-----	\$1,610,390.00	-----
Nine Additional Systems	-----	-----	<u>\$2,836,360.00</u>
Prime Costs	\$3,472,987.00	\$5,279,967.00	\$6,638,884.00
General and Administrative	<u>\$ 694,597.00</u>	<u>\$1,055,993.00</u>	<u>\$1,327,777.00</u>
Total Estimated Cost	\$4,167,584.00	\$6,335,960.00	\$7,966,661.00
Fixed Fee	<u>\$ 354,245.00</u>	<u>\$ 538,557.00</u>	<u>\$ 677,166.00</u>
Total Estimated Cost and Fixed Fee	\$4,521,829.00	\$6,874,517.00	\$8,643,827.00

* Costs contained in Attachment "A" are not included in this summary.

ATTACHMENT "A"

Capital Equipment Opt. Tooling Required for Optical Systems & Windows

Coating Equipment:

1. Monitoring Equipment	\$ 6,000.
2. Set of Narrow Band Interference Filters	1,700.
3. Mechanical System for Rotation Inside Bell Jar	\$ 4,000.
4. 18" Bell Jars (Extras)	\$ 1,000.
4. 18" Vacuum System	<u>\$ 10,000.</u>
	\$ 22,700.

Grinding Equipment:

1. Tilt Head Blanchard	\$ 18,000.
2. Milling Mach. & Accessories	\$ 18,000.
3. Large Sawing Mach.	\$ 14,000.
4. Troyke Table	<u>\$ 3,600.</u>
	\$ 53,600.

Polishing Equipment

Rebuild Polishing Mach.	
Fabricate New Turntable	\$ 3,000.
(2) Loh Single Spindle Polishers	<u>\$ 3,200.</u>
	\$ 6,200.

\$ 82,500.00

8% Handling & Installation \$ 6,600.00

\$ 89,100.00

Suggest this equipment be procured under contract RE-519